Ordering number: EN 1125D



No.1125D

Monolithic Linear IC

LA2113

FM Noise Canceler

The LA2113 is a DIP-16 version of the LA2110. It has the capability to effectively remove external noise (pulse noise) caused by engine, etc. and is used in conjunction with a PLL FM multiplex stereo demodulator (LA3373 and the like) with pilot signal canceler.

Features

- Pilot signal compensation function.
- By using in conjunction with PLL FM multiplex stereo demodulator with pilot signal canceler, adverse effect caused by pilot signal can be compensated.
- Low distortion : THD=0.02%, 300mV
- Variable input type noise AGC system : This system widens the noise detector's dynamic range, so that pulse noise can be satisfactorily detected even in a weak electric field, and pulse noise is removed without adversely affecting distortion.

Maximum Ratings at T_a=25°C

				unit
Maximum Supply Voltage	V_{CC}max		16	V
Allowable Power Dissipation	$P_d$max	T_a≦50°C	450	mW
Operating Temperature	Topr		-20 to +75	°C
Storage Temperature	T_{stg}		-40 to +125	°C

Recommended Operating Conditions at T_a=25°C

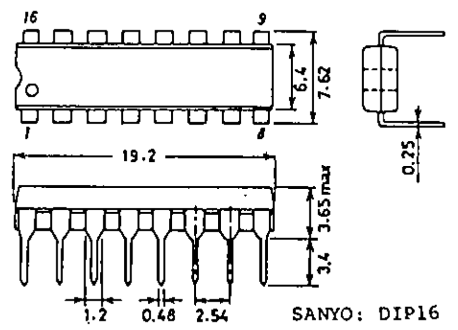
			unit
Recommended Supply Voltage	V_{CC}	12	V
Operating Voltage Range	V_{CC}op	8 to 15	V

Operating Characteristics at T_a=25°C, V_{CC}=12V, See specified Test Circuit.

		(Input pin)	(Output pin)	min	typ	max	unit
Quiescent Current	I_{cco}				16	25	mA
Voltage Gain	VG	V_7=300mV, f=1kHz	OUTPUT	-0.2	0.8	1.8	dB
Input Signal Dynamic Range	VD	V_7, f=1kHz	OUTPUT, THD=1%	1.3			V
Input Impedance	z_{in}	V_7=300mV, f=1kHz		36k	51k	67k	ohm
Total Harmonic Distortion	THD	V_7=300mV, f=1kHz	OUTPUT		0.01	0.03	%
Low-Pass Amp Gain	VG_L	V_5=300mV, f=1kHz	V_4	1.0	1.1	1.2	time
High-Pass Amp Gain	VG_H	V_9=100mV, f=200kHz	V_{10}	1.2	1.4	1.65	time
Inverting Amp Distortion	THD_I	V_{15}=100mV, f=19kHz	OUTPUT			0.1	%
Inverting Amp Dynamic Range	VD_I	V_{15}, f=19kHz	OUTPUT, THD=1%	300			mV

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Package Dimensions
(unit: mm)
3006B

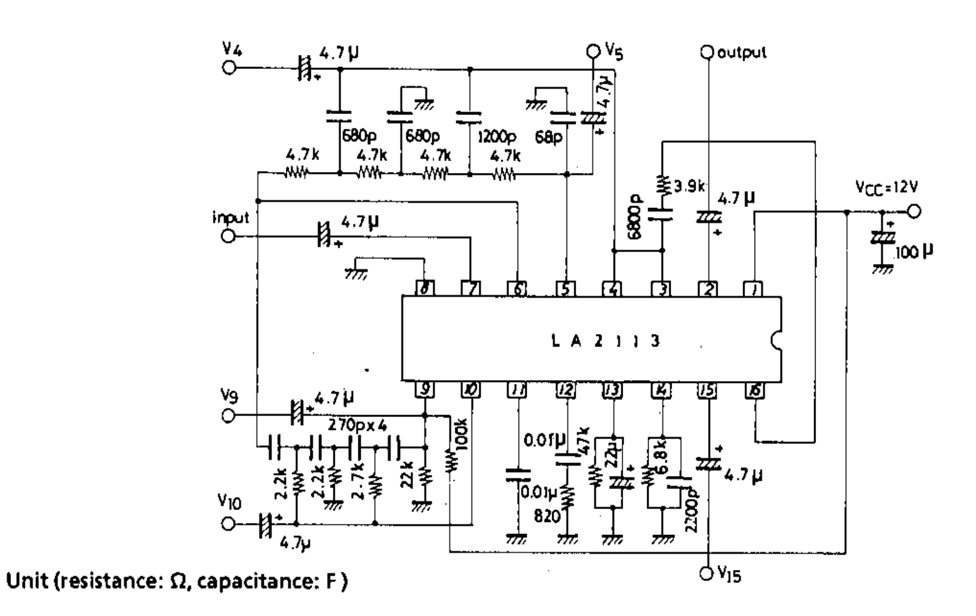


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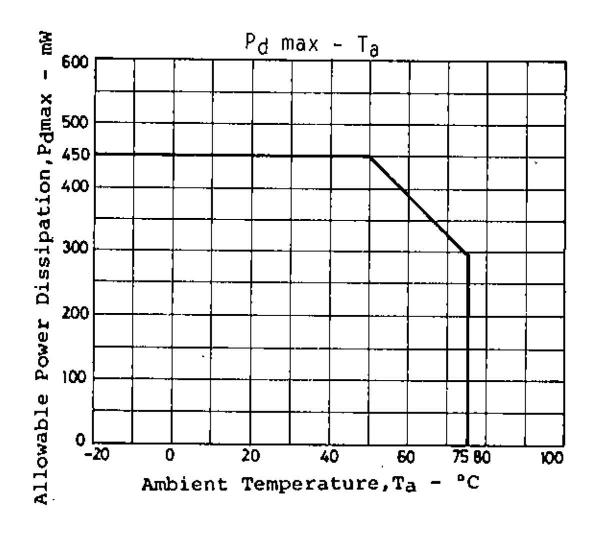
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		(Input pin)	(Output pin)	min	typ	max	unit
Inverting Amp Gain	VG_I	V_{15}=100mV, f=19kHz	OUTPUT	1.0	1.3	1.6	time
Output Noise Voltage	V_{NO}	V_7, V_{15} shorted to GND	OUTPUT, 100kHz low-pass filter		30	60	μV
Gate Time	t_{gate}	V_7=100mV_{p-p}, 1us, f=1kHz	OUTPUT	13	21	30	μs
Noise Sensitivity	S_N	V_7, 1us, f=1kHz	OUTPUT			30	mV_{p-0}

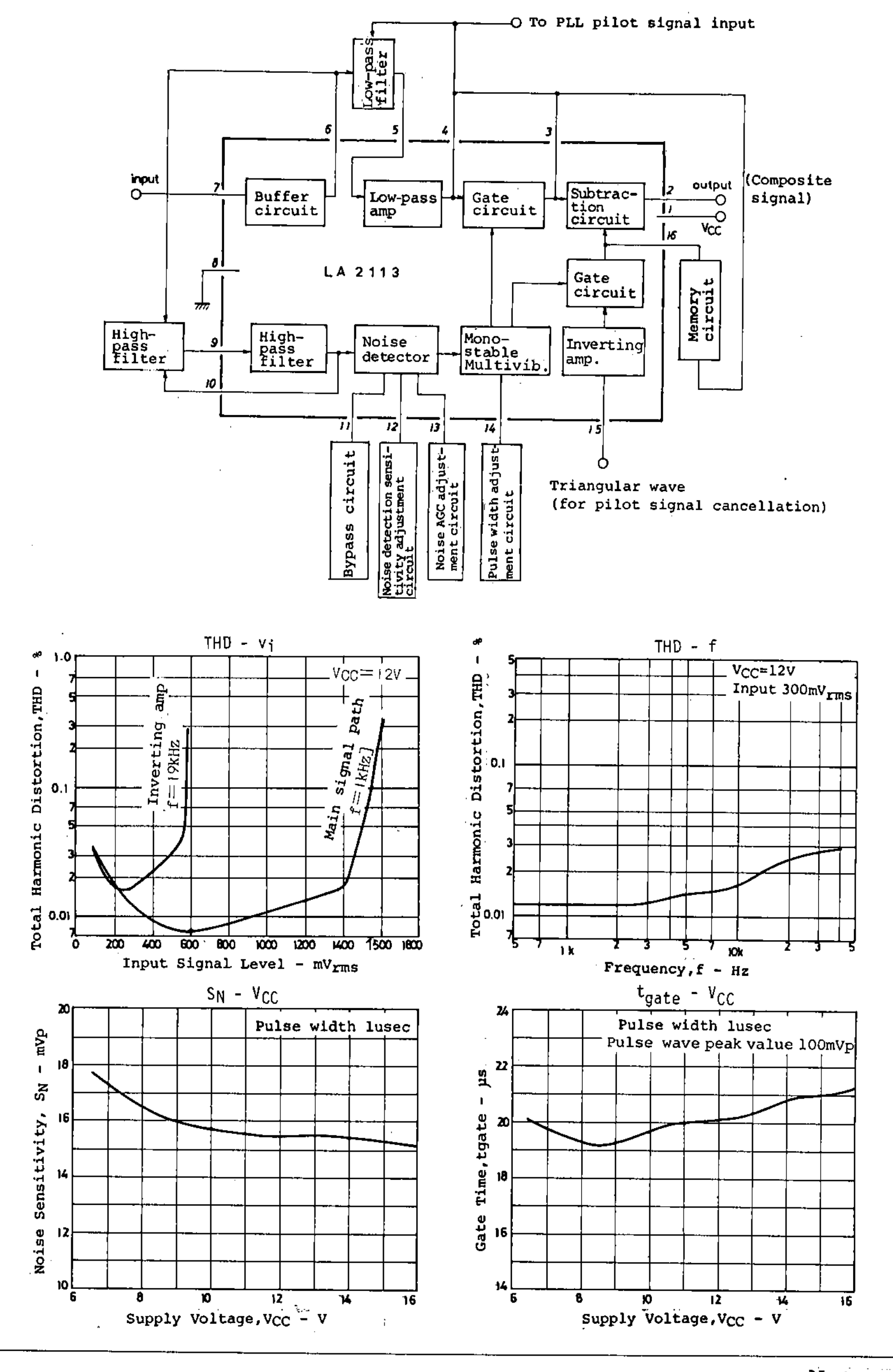
Test Circuit



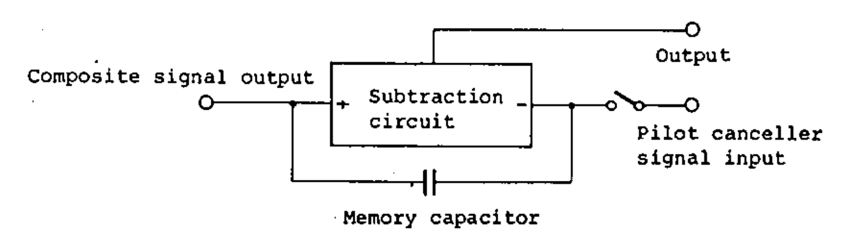
Unit (resistance: Ω, capacitance: F)



Equivalent Circuit Block Diagram



[Theory of LA2113 Noise Canceller]

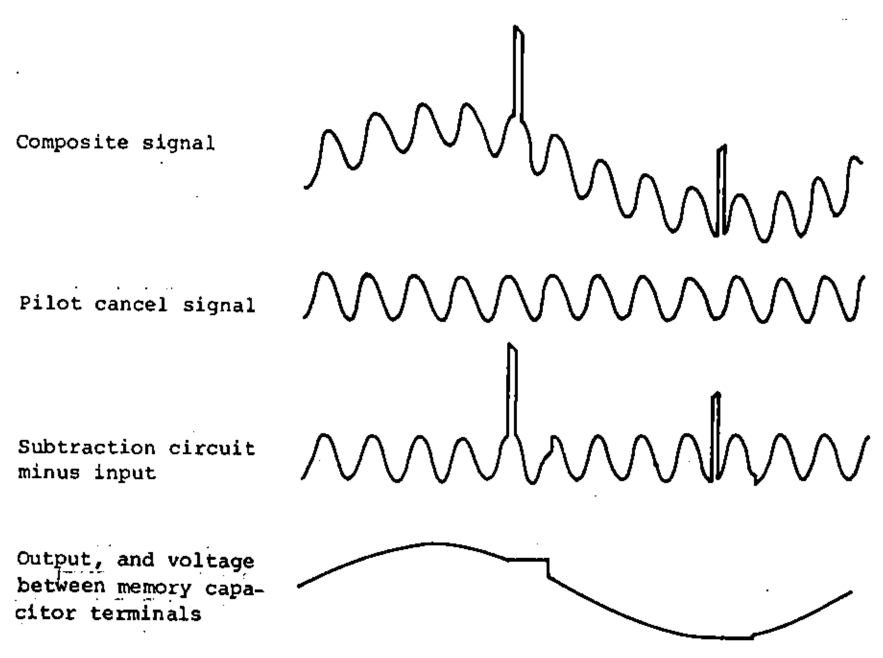


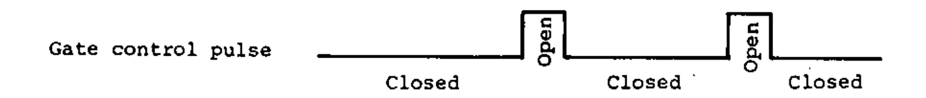
In order to simplify the operation theory, the composite signal component is given only as a low frequency signal and a pilot signal, and the pilot cancel signal has the same phase, same amplitude as the pilot signal in the composite signal.

Since the output voltage is the differential voltage of the plus and minus input of the subtraction circuit, it is equal to the voltage between the memory capacitor terminals. When the gate is closed, the composite signal is applied to the plus input terminal of the subtraction circuit, and the pilot cancel signal is applied to the minus input terminal. Thus the pilot signal is cancelled from the output and only the low frequency signal appears. In the same way, the voltage between the memory capacitor terminals is the differential voltage of the composite signal and the pilot cancel signal, so only the low frequency signal appears.

When pulse noise is generated and the gate opens, the plus input and minus input signal waveforms of the subtraction circuit become equal. This is because the input impedance of the subtraction circuit is extremely high, so the memory capacitor is considered AC-shorted. Thus, when pulse noise is generated in the composite sig-
is the voltage held by the memory capacitor. This voltage is that between
traction circuit. As a result, pulse noise does not appear in the output. The voltage in the output has a DC level difference of plus and minus input, and that is the voltage maintained by the memory capacitor. This voltage is that between the memory capacitor terminals just before the gate opens, so it is the low frequency signal voltage just before the gate opens. Because the subtraction circuit input impedance is high, no charge/discharge current flows in the memory capacitor while the gate is open, so the memory capacitor can hold the voltage between its terminals.

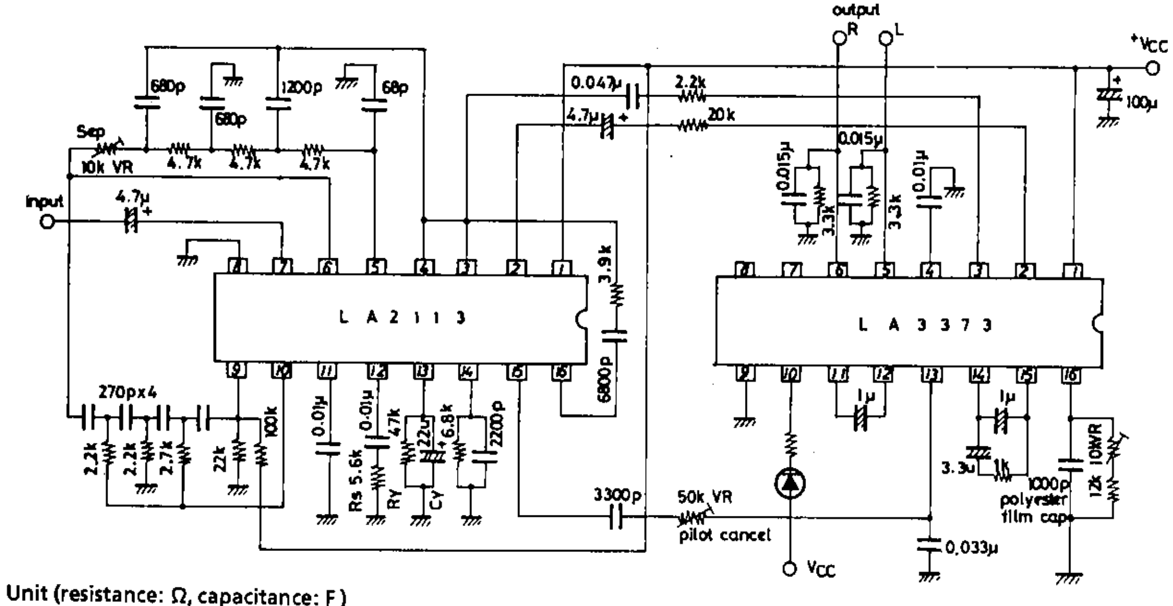
The voltage waveforms are illustrated below.





Note : The pilot cancel signal is given as sinusoidal in this explanation, but in the actual specimen application circuit, pilot cancel is performed by a triangular wave.

Sample Application Circuit: LA2113 & LA3373



Unit (resistance: Ω, capacitance: F)

Note : When using the Sample Application Circuit:

1. Separation adjustment is performed with 10kohms variable resistance in low-pass filter.
2. Change noise detection sensitivity control R_S to an adequate value for strong or medium electric field.
3. Adjust noise AGC with C_Y, R_Y for effective noise suppression in a medium or weak electric field.
4. Adjust pilot cancel degree with variable resistance of 50kohms connected to LA2113 pin 15.
5. By changing the 1uF capacitor between LA3373 pin 11 and 12, pilot cancel follow-up response time can be changed. But if the value is decreased, distortion factor, etc., will be adversely affected.

For detailed data on the Sample Application Circuit, refer to the catalog of the LA2110.